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Study Protocol for clinicaltrials.gov

Official Title: Digital Mental Health Intervention for Nonsuicidal Self-Injury in Young Adults

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PROTOCOL TITLE: Digital Intervention for Young Adults who Engage in Nonsuicidal Self-Injury

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VERSION DATE:
01/14/2024

STUDY SUMMARY:

Investigational Agent(s) (Drugs or Devices)	
IND / IDE / HDE #	
Indicate Special Population(s)	☐Children ☐ Children who are wards of the state ☐ Adults Unable to Consent ☐ Cognitively Impaired Adults ☐ Neonates of Uncertain Viability ☐ Pregnant Women ☐ Prisoners (or other detained/paroled individuals) ☐ Students/Employees
Sample Size	90
Funding Source	National Institute of Mental Health (NIMH)
Indicate the type of consent to be obtained	☐Written ☐Verbal/Waiver of Documentation of Informed Consent ☐Waiver of HIPAA Authorization ☒Waiver/Alteration of Consent Process
Site	☐ Lead Site (For A Multiple Site Research Study) ☐ Data Coordinating Center (DCC)
Research Related Radiation Exposure	☐Yes ☒ No
DSMB / DMC / IDMC	☒Yes ☐No

FEDERAL FUNDING: NIMH R34MH128410

OBJECTIVES:

The aim of this study is to test a digital mental health intervention (DMHI) designed for young adults who engage in nonsuicidal self-injury (NSSI). The DMHI will be based on cognitive-behavioral principles and emotion regulation strategies that have demonstrated effectiveness in reducing NSSI across numerous treatment trials. The specific design of the intervention will be informed by rigorous user-centered design [see description of design procedures in STU00214610], though it will include a highly interactive conversational agent – "smartphone-based computer programs designed to respond to users in natural language, thereby mimicking conversations between people"[84] – that conveys psychoeducational content and guides participants through learning and practicing skill-based activities.

In this trial we assess the feasibility of conducting a randomized controlled trial (RCT) of the 8-week DMHI for non-treatment engaged young adults with repeated NSSI. We will conduct a 3-arm feasibility trial, randomizing participants to receive the self-guided DMHI, the DMHI with low-intensity coaching, or an active control, wherein participants receive limited non-interactive psychoeducation through their smartphone. We test coaching as it has been found to improve DMHI use[36] and mental health outcomes, though this has not been universally observed. [77,78] Initial randomization will be generated in permuted blocks of 6 using a computer program, with participants assigned on a 1:1:1 ratio. The control group will serve as the reference group to verify the effectiveness of the DMHI while the comparison of self-guided to coached deployments will evaluate the added benefit of coaching.

Aims:

Aim 1. Evaluate the feasibility of the intervention and trial procedures. The primary aim of this study is to evaluate the feasibility of conducting a fully-powered randomized controlled trial (RCT), based on recruitment, adherence of participants in treatment conditions, and collection of outcome assessments during both treatment and follow-up periods. Participants will be randomized to receive the self-guided DMHI treatment, the DMHI treatment with coaching, or a psychoeducation control.

Aim 1a. Evaluate DMHI effectiveness in reducing the primary outcomes (frequency of NSSI behaviors and urges), secondary outcomes (suicidal ideation, and symptom severity for depression, anxiety, and borderline personality disorder), and psychological treatment targets (emotional, cognitive, and behavioral regulation; self-efficacy to resist NSSI) relative to a psychoeducation control.

Aim 1b. Evaluate the effect of coaching on subjective and objective engagement targets (number of app launches, time from first to last use) and all primary and secondary outcomes.

Aim 2. Experimental therapeutics. We will explore the mediational effects of psychological targets (emotional, cognitive, and behavioral regulation; self-efficacy to resist NSSI) and engagement targets (app use and subjective engagement) on NSSI frequency and urges. We will also explore moderation effects of severity of NSSI (number of methods), psychiatric comorbidity (e.g., depression, anxiety), trauma history, and demographics (gender, race, or ethnicity). Moderation analyses will be conducted on all participants who have received the DMHI.

BACKGROUND:

Nonsuicidal self-injury. Nonsuicidal self-injury disorder (NSSID) is included in the DSM-5 as a condition requiring further study.[1,2] NSSI is common, with community prevalence rates of 17.2% for adolescents, 13.4% for young adults, and 5.5% for those beyond young adulthood.[3] Prevalence is much higher in those with mental health diagnoses.[4–6] NSSI is associated with considerable burden, including significant role impairment in daily life, increased risk of developing a mental health disorder, hospitalization, and permanent scarring.[7–10] NSSI is also associated with higher rates of suicidal thoughts and behaviors. Around 70% of individuals with a history of NSSI attempt suicide at least once in their lifetime, and around 55% report multiple suicide attempts, with greater risk incurred through repeated NSSI episodes.[4,10–12] Timely interventions to reduce NSSI could have a significant impact, particularly among younger people, in improving mental health and reducing the risk of suicide.[11,13,14]

Treatments for NSSI are often time and resource intensive. Treatments that include cognitive behavioral treatment strategies, which engage each of these systems, show the strongest evidence for NSSI reductions. Treatments that focus on emotion regulation, such as Dialectical Behavior Therapy (DBT)[15] and Emotion Regulation Group Therapy (ERGT),[16] have been particularly effective. DBT focuses

on cognitive-behavioral and acceptance strategies,[15] and has been associated with reductions in suicidal and nonsuicidal self-injury among patients with borderline personality disorder, in multiple trials.[17–21] In trials examining NSSI as a primary outcome, two RCTs found evidence supporting the effectiveness of DBT in reducing NSSI frequency, when compared to treatment as usual (TAU) conditions.[22,23] Though evidence for DBT is strong, it is a time and resource intensive treatment, typically requiring multiple hours per week over 3 months to 1 year, making it inaccessible to many young adults and difficult to scale.[17,23,24]

Shorter face-to-face psychological treatments, ranging from 6-14 weeks in length, have also been effective in reducing NSSI.[16,25] For example, ERGT, a 14-week group treatment focused on emotional acceptance and modulation produced significant reductions in frequency of NSSI in trials when compared to TAU.[16,26] A trial of a 12-session cognitive behavioral intervention resulted in significant reductions in self-harm, suicidal ideation, depression, and anxiety relative to standard psychiatric treatment.[25] Similarly, Manual-Assisted Cognitive-Behavioral Therapy, a six-session manualized treatment targeting cognitive and problem-solving deficits has demonstrated reductions in combined outcomes of suicidal and nonsuicidal self-injury in two trials,[27,28] and frequency and severity of self-harm behaviors in a smaller RCT.[29] Lastly, the Treatment for Self-Injurious Behaviors is 9-session behavioral intervention developed for young adults with NSSI. A small open pilot trial and a small RCT found significant reductions in NSSI urges and past month NSSI behaviors.[30,31]

Across these validated psychological treatments for NSSI, there is converging support for the importance of the following treatment components: (1) motivational enhancement; (2) functional assessment to identify individual antecedents, consequences, and functions of the behavior; and (3) the development and practice of new cognitive strategies (e.g., cognitive restructuring);[25,28,32] (4) behavioral strategies (e.g., differential reinforcement);[30] and (5) emotion regulatory strategies (e.g., mindfulness).[16,32]

However, most young adults with NSSI do not seek formal mental health care. Around 50% of young adults with NSSI have never disclosed their behavior to anyone[33,34] and fewer than 20% across all age groups seek professional help for NSSI.[34–36] While young adults have the highest prevalence of mental health conditions (26.3%), they are also the adult age group with the lowest rates of treatment.[37] Young adults report many barriers to accessing traditional face-to-face care, including availability of specialized services, time and transportation challenges, and costs.[38,39] However, NSSI presents several additional and unique barriers, including reluctance to disclose NSSI due stigma or shame, a lack of motivation to change behaviors due to an inability to recognize the severity or seriousness of NSSI, and fears of losing NSSI as a coping strategy.[40–43] Young adults with NSSI report being open to DMHIs – particularly interventions that focus on skill acquisition.[44,45] To date, however, few fully digital interventions exist to support young adults in NSSI reduction – and none have undergone rigorous testing. A brief DMHI designed specifically for young adults with repeated NSSI, who are not currently in treatment, has the potential to address the aforementioned barriers to treatment and provide coping skills necessary for NSSI behavior change.

Digital mental health interventions (DMHIs). Meta-analyses consistently show that mobile app and internet-based DMHIs are effective at reducing mental health symptoms, particularly depression and anxiety, across many RCTs.[46–48] Nearly 96% of young adults use smartphones, and they are most likely to access the internet via their mobile device.[54] Young people with NSSI frequently go online for self-injury help-seeking, distraction, and social support.[55–57] Thus, smartphone-based apps are an ideal platform for delivering a DMHI for young adults with NSSI because smartphones are ubiquitous, they are a medium that is already being used by this population, and smartphone-based DMHIs overcome many of the treatment access barriers noted above.

DMHIs for young adults with NSSI. In the context of NSSI, preliminary research supports the acceptability of mobile- and web-based DMHIs, though evidence for the effectiveness of these interventions is limited and mixed.[58,59] To date there have been three single-arm pilot trials of DMHIs for NSSI. One examined the use of the DBT Coach app as an adjunct to DBT treatment over 6 months among 16 participants.[60] While the app showed good engagement, it is not possible to determine the effect of the app independent of the standard DBT treatment. The other two single-arm trials evaluated DMHIs for adolescents. One examined a 12-week web-based intervention adapted from a manualized treatment for adults with borderline personality disorder (Emotion Regulation Individual Therapy for Adolescents). The treatment was aimed at reducing NSSI frequency by targeting emotion regulatory capacity with 25 adolescents,[61] and included a parent-facing program. Adolescents showed a significant pre-post reduction of 69% in NSSI over 6 months, as well as improvements in global functioning and emotion dysregulation. The third trial evaluated a 12-week app-based intervention for self-harm in 44

adolescents and showed significant reductions in depressive and anxiety symptoms.[62] While self-harm behaviors were not formally analyzed, they were assessed and appeared to show a strong reduction during treatment, relative to self-reported frequency in the month prior to intervention. No app use data were reported; however, qualitative acceptability measures ranged from moderate to high. While promising, we note that interventions for adolescents must be designed differently from those for adults, as treatment strategies may be different, and parents are also frequently included.

There have been 2 randomized controlled studies of narrowly defined experimental interventions, as opposed to a full DMHI based on psychotherapeutic principles. One study evaluated Therapeutic Evaluative Conditioning (TEC), similar to attentional bias interventions, in which adults with NSSI were asked to pair self-related words (e.g., me, myself, I) with images depicting self-cutting or suicide and death in 1-2 minute sessions.[63] TEC produced modest reductions in self-cutting over 4 weeks trials, relative to a control condition, but no effects were observed for suicidal ideation. Adherence was low, with 29% of TEC participants never opening the app, 49% being categorized as low users, and only 22% were high users. The other trial compared two 4-week online expressive writing interventions to a non-expressive writing control condition. While there were significant reductions in NSSI across all groups, there were no significant differences between treatment and control conditions.[64] This underscores the importance of control conditions in trials of interventions for NSSI.

Collectively, these findings suggest that app-based interventions can engage people with NSSI. However, novel DMHI approaches such as TEC or expressive writing are either not highly engaging or not effective. Treatment strategies from validated psychological treatments appear to be most likely to produce a reduction in NSSI symptoms. Overall, research on DMHI for NSSI is limited and there are no DMHIs based on evidence-based psychotherapeutic principles that have demonstrated efficacy for NSSI. The proposed study addresses these limitations by designing a DMHI based on evidence-based psychotherapeutic principles, employing user-centered design processes to give voice to end-users, and evaluating the DMHI in both coached and self-guided deployments against a control condition through a feasibility RCT.

Our DMHI. A DMHI based on cognitive-behavioral principles and emotion regulation strategies may be capable of providing support, and reducing NSSI in a high risk, non-treatment engaged population. A consistent challenge in treatment of NSSI is helping patients implement newly acquired skills in the moment that they are needed.[65] Our DMHI will leverage within-app ecological momentary assessment (EMA) and messaging to track NSSI behaviors and detect moments of high NSSI risk, and subsequently suggest tailored skill use.

PRELIMINARY DATA: All user-centered design-related research activities proposed in STU00214610 have been completed and informed the development of the DMHI.

STUDY ENDPOINTS:

Participants will receive the self-guided DMHI, the DMHI with low intensity coaching, or a psychoeducation control. Participants will complete study within 16 weeks, this includes 8 weeks of intervention and follow up at 1 and 2 months.

STUDY INTERVENTION(S) / INVESTIGATIONAL AGENT(S):

1. **Self-guided digital intervention for NSSI:** The self-guided digital intervention for NSSI will consist of 8 weekly modules containing psychoeducation and skill-based practice. All content is delivered by a highly interactive conversational agent that guides users through the app content via a text-like interface. Psychoeducational content and psychological strategies center on cognitive behavioral principles and acceptance-based emotional regulation strategies.
2. **Digital intervention for NSSI with coaching:** Digital intervention for NSSI with coaching is the same as above, with the addition of lightweight coaching which consists of a one 20-30 minute engagement call at the beginning of treatment. Thereafter, coaches will check in with participants via SMS twice per week and respond to patient texts, calls, or emails. All coaches will be trained and supervised by Dr. Kaylee Kruzan, licensed social worker and Research Assistant Professor in CBITs and Preventive Medicine at Northwestern.
3. **Control app:** The control app uses the same interface as above but contains only 8 modules with psychoeducation on: Water Intake, Sleep Hygiene, Active Lifestyle, Safe Skin Protection, Social Connections, Healthy Media Consumption, Stress Management, Green Spaces.

PROCEDURES INVOLVED:
We will conduct a pilot feasibility trial, with 90 young adults with nonsuicidal self-injury (NSSI), of an 8-week app-based digital mental health intervention (DMHI). Participants will be randomized to receive either the self-guided DMHI, coached DMHI, or an active control in which participants receive only the psychoeducational content via the app. Study participation will be 16 weeks, with assessments at baseline, and weeks 4, 8, 12, and 16. There will be a brief 10-15 minute "start up" call at the beginning of the trial, following consent, where participants can ask research staff questions and get help setting up the app on their phone.

Ninety participants will be randomly assigned on a 1:1:1 ratio to either the self-guided DMHI, the DMHI with coaching, or active condition. The treatment conditions will receive the DMHI from baseline to week 8, and are then followed with assessments only post-treatment to week 16. The active control will receive psychoeducation only. Participants will be permitted to keep the app on their phone and continue using it after their 8-week intervention period ends. This is consistent with how digital interventions are used, and has been a standard feature of DMHI trials.[53,66–68] This will also allow us to examine how long people continue using the tools, once the content modules have been completed, which will be useful in determining if the length of treatment should be adjusted in future adaptations.

When a participant concludes the intervention, they may be asked to engage in a 30-45-minute user feedback interview, to identify problems and deficiencies with the aim of improving the intervention. We will select a subset of participants reflecting different use patterns (high and low) to gather feedback on their experience using the app. Participants who discontinue the intervention prior to the study end will be contacted and invited for an interview at the time their discontinuation is confirmed.

The three components/data types of this study are:

App use data: This will include participant use data (e.g., log data on use, frequency and time of app use, questions answered, and answers to questions).

Interview data: Participants may be invited to a telephone or videoconference interview at the end of the intervention period. Interviews will last no more than 45 minutes and will be audio recorded and transcribed. Interviews are semi-structured, such that we touch on certain high priority topics and questions, but also may deviate from the script to ask follow-up questions based on users' responses. Interviews will elicit qualitative feedback about the acceptability and usefulness of the app, allowing us to understand the nature of problems encountered.

Assessment data. Data will be gathered from study participants as outlined in the table below. The primary outcome, frequency of NSSI behaviors, will be measured using the Alexian Brothers Assessment of Self-Injury Scale (ABASI)[69] which will be adapted to measure monthly NSSI frequency through a checklist of the most common methods of self-injury. The primary outcome of NSSI urges will be measured using the Alexian Brothers Urge to Self-Injure Scale (ABUSI).[70] All measures of primary and secondary outcomes, and targets will be administered at baseline, and weeks 4, 8 , 12, and 16 except for measures of usability and subjective engagement which will not be administered at baseline, as participants will not have been exposed to the treatment. Moderators (including demographics, mental health diagnoses, NSSI characteristics, trauma history) are administered at baseline only. All self-report assessments will be conducted online using REDCap.[71] In addition to the surveys listed in the list of measurements below participants will complete the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) and the DSM-5 cross cutting symptom measures (included in this modification) at Baseline and participants will complete the General Help Seeking Questionnaire and question on current use of medication at all timepoints.

All measures are self-report. For follow-up assessments, participants who do not respond will be contacted by research staff and, if necessary, the primary measures will be administered over the phone. We will ensure that participants understand that they are free to terminate the treatment at any time, and that compensation is for assessment completion only.

Table 2. List of Measurements

Outcome	Measurement	Assessment timepoints
Primary Outcomes		
NSSI behavior frequency	Alexian Brothers Assessment of Self-Injury (ABASI checklist)[111]	Baseline, weeks 4, 8, 12, 16
NSSI urge frequency	Alexian Brothers Urges to Self-Injury Scale (ABUSI)[112]	Baseline, weeks 4, 8, 12, 16
Secondary Outcomes		
Depression severity	Patient Health Questionnaire, 9-item (PHQ-9)[145]	Baseline, weeks 4, 8, 12, 16
Anxiety severity	Generalized Anxiety Disorder, 7-item (GAD-7)[146]	Baseline, weeks 4, 8, 12, 16
Borderline personality disorder symptom severity	Borderline Evaluation of Severity Over Time (BEST)[147]	Baseline, weeks 4, 8, 12, 16
Suicidal ideation	Depression Symptom Index – Suicidality Subscale (DSI-SS)[148]	Baseline, weeks 4, 8, 12, 16
Psychological Treatment Targets		
Emotion Regulation	Difficulties in Emotion Regulation Scale (DERS)[149]	Baseline, weeks 4, 8, 12, 16
Cognitive Regulation	Dysfunctional Attitude Scale – Short Form (DAS-SF1)[150]	Baseline, weeks 4, 8, 12, 16
Behavioral Regulation	Cognitive and Behavioral Response to Stress Scale (CBRSS; Behavioral subscales)[151]	Baseline, weeks 4, 8, 12, 16
Self-efficacy to resist self-injury	Self-efficacy to Resist Self-injury (adapted from SEASA)[152,153]	Baseline, weeks 4, 8, 12, 16
Engagement Targets		
Objective Engagement	App use (number of app launches, time from first to last use)	Continuous
Subjective Engagement / Usability	TWEETS	Weeks 4, 8
Moderators		
Demographics	Age, race, ethnicity, gender, sexual orientation	Baseline
NSSI characteristics (severity [# of methods], age of onset)	Self-injury survey	Baseline
Childhood Trauma History	Childhood Trauma Questionnaire (CTQ-SF)[155]	Baseline

DATA AND SPECIMEN BANKING
Deidentified data will be stored indefinitely for secondary analyses.

SHARING RESULTS WITH PARTICIPANTS
Study results will be made available to the public through publications. Interested participants can opt into receiving an email from the study team when results are published in the consent process by answering “Yes” to an optional element.

STUDY TIMELINES

Enrollment Timeline
The anticipated start date for the trial recruitment is April 2024 . All participants will be recruited through Mental Health America as described in the recruitment section below. Consent, randomization and assessment will be handled through REDCap. We feel confident in our recruitment strategy, which is based on our prior work using similar methods. We expect to enroll approximately 10 participants per month during the trial, which is very achievable given our experience with online recruitment and our virtual clinical trials platform. The lost-to-follow-up rate will be minimized by 1) paying participants $20 for each assessment and 2) encouraging participants to continue completing paid outcomes assessments even if they drop out of treatment.

Timeline of Participant Activities
Active participation will last 16 weeks for each study participant. Study assessment milestones are laid out in the table below above.

The anticipated start date for primary analyses is January 1st, 2025.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria: 1) **Current NSSI**, defined as self-injury on 2 or more days in the past month, as assessed by the ABASI.[69] This cut off was chosen in place of the DSM-5 frequency criterion, which is NSSI on 5 days over 1 year, because it is more consistent with current recommendations for diagnostic criteria.[74] The validity of the DSM-5 criteria have been subject of controversy – with many proposing an increase in NSSI frequency threshold and a focus on more proximal NSSI.[75–79] The 2 or more days within one month criterion is also consistent with criteria used in previous trials.[63,64] 2) **Has a smartphone**. 3) **English language** skills sufficient to engage in the consent and intervention procedures. While addressing non-English speaking young adults is an important goal, we focus on English-speaking users in this first stage for feasibility. If successful, future versions in other languages will be developed and evaluated. 4) **Age 18 to 24**.

Exclusion criteria: 1) **Severe mental health diagnoses** for which this intervention would be inappropriate (e.g., psychotic or bipolar disorders) ;[80] 2) **Severe suicide risk**, including suicidal ideation with a plan and intent to act, or history of suicide attempts in the past year .

VULNERABLE POPULATIONS
N/A

RECRUITMENT METHODS
Recruitment: Recruitment will occur through five online venues: 1) Mental Health America (MHA) 2) Online web forums related to self-injury (e.g., self-injury subreddit on Reddit) after securing approval from moderators 3) The Cornell Research Program on Self-injury and Recovery (CRPSIR) Listserv (a research website that houses trainings and resources related to self-injury recovery); 4) Social media marketing (e.g., Facebook, Instagram, Twitter), and through and 5) Registries such as Researchmatch.com and BuildClinical. We will prioritize recruitment from venues 1-3, and we will use registry in the unlikely event the primary recruitment methods are insufficient.

Mental health America: Mental Health America is a non-profit organization whose mission is to address the needs of those living with mental illness, prevent psychological decompensation, and to promote mental health as a crucial component of general health. MHA will support recruitment by displaying an IRB approved clickable teaser advertisement for the current study to individuals who complete a mental health screening on their website . MHA will not be engaged in the research or have access to any identifiable information gathered through this study.

Individuals can elect to click the advertisement if they are interested in learning more about the study. Once clicked this ad will direct interested individuals to read an IRB approved description of the study that will be hosted on the Center for Behavioral Intervention Technologies (CBITs) website. The study description will contain a link to initiate an online screener to assess eligibility. Individuals who elect to complete the screening questionnaire by clicking on the link will be taken to a screening consent on NUs REDCap. Those that provide consent will advance to the screening, where they will also provide contact

information. Those that are eligible will be further reviewed by the research team for appropriateness and to maintain demographic balance. Those selected to proceed with enrollment will receive an email from a research study team member with a link to the study informed consent document and will be given the option to provide informed consent (eConsent) to participate in the study will proceed to the baseline survey and will receive a message that they will be contacted within 1 – 3 days by a study coordinator via email for more details for the set up call. Outreach may be conducted via phone, email or text to facilitate scheduling and completion of assessments.See Figure 1 below for the full recruitment – enrollment pipeline.

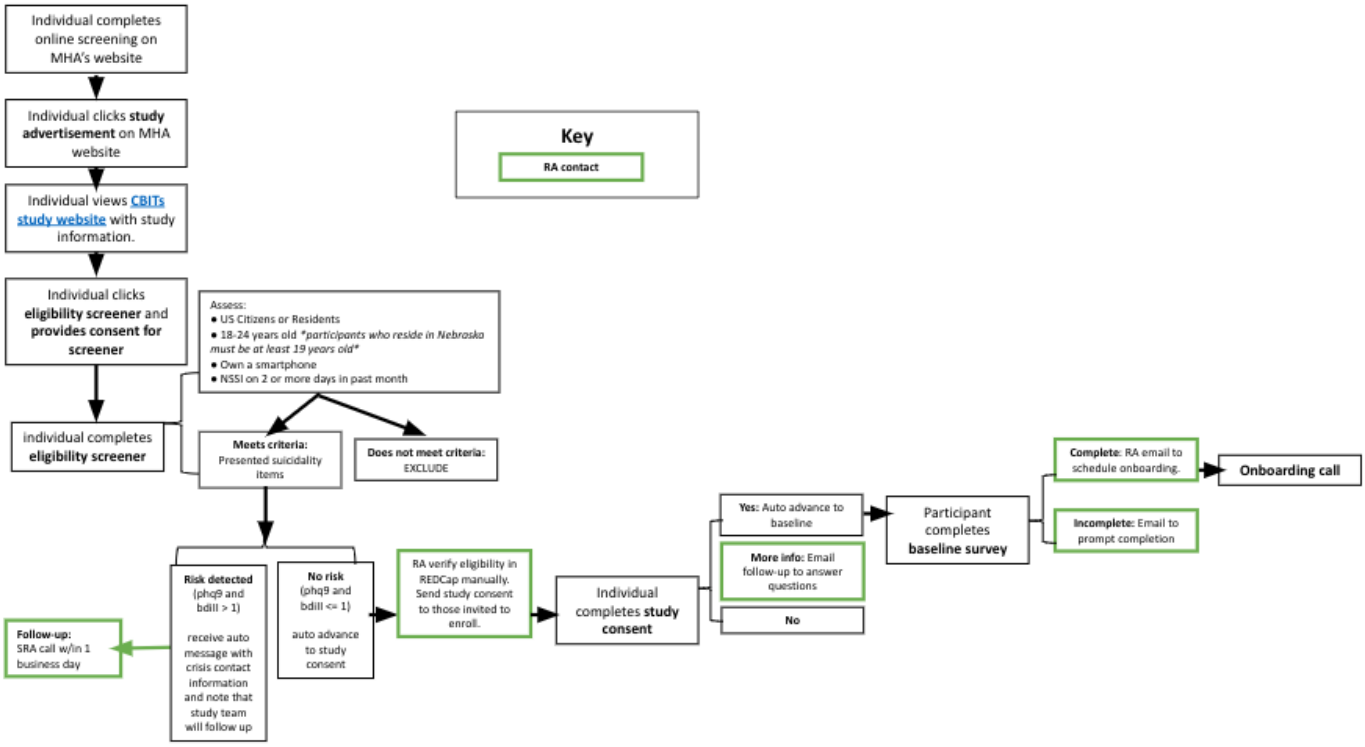


Figure 1. Recruitment to enrollment pipeline

Determining Eligibility: The RedCAP screening survey will be used to 1) determine eligibility and 2) securely gather and store potential participant contact information. See attachment for the RedCAP Eligibility Survey for more detail. For participants that are ineligible to participate, researchers will notify the potential participant via email, thanking them for their interest (See eligibility survey). *The screener **may** automatically collect individuals' IP addresses. This information will be stored within each screener survey response. If concerns arise that a participant is not in the U.S., the research team will check the IP address to confirm its location in the U.S.*

CRPSIR: We will post a clickable advertisement to the CRPSIR website and disseminate an approved email advertisement through the Listserv (See attachments for email and website advertisements). Individuals can elect to click the advertisement if they are interested in learning more about the study. Once clicked this ad will direct interested individuals to read an IRB approved description of the study that will be hosted on the Center for Behavioral Intervention Technologies (CBITs) website (See attachment for study description) and the procedure will unfold exactly as above.

Social media: Study information will be circulated within online social media settings, including Facebook and Twitter (see the attachments for ad). Once the advertisement is clicked the procedure will unfold exactly as above.

Online web forums related to self-injury: We will post a clickable teaser advertisement in online forums related to self-injury after securing approval from forum moderators. We will follow 3-step process to ensure that our research activities are perceived as credible and that we are respectful of the forum members and forum norms in

recruitment: 1) A research team member will join forums, 2) Upon entry, we will ask forum moderator (if applicable) for permission/approval to post recruitment ad, 3) If approval is secured, we will post a clickable ad in general forum and monitor direct messaging for interest. Once the advertisement is clicked the procedure will unfold exactly as above.

Registries: An email explaining the study will be sent to potential participants identified in the ResearchMatch or CBITs registry (See attachments for ad). Once the advertisement is clicked the procedure will unfold exactly as above.

BuildClinical: We will also contract with BuildClinical, a data-driven platform that helps academic researchers recruit participants for research studies more efficiently using social media (e.g., Facebook, Reddit), digital platforms and sites (e.g., Google, WebMD), software, and machine learning. BuildClinical may help with screening but will not have access to study data. Specifically, BuildClinical utilizes study advertisements to engage participants and redirects them to a study specific landing page should they click it. On the landing page, the interested individual can complete online pre-screen questions that get routed into BuildClinical's platform. These questions assess information such as the person's contact information, and eligibility criteria such as engaging in NSSI in the past month (included in documents upload). Northwestern study team members will have access to a dashboard of participant "leads". Using this list of pre-screened individuals, study team members will contact potential participants, beginning the screening process noted below that is followed by those from other recruitment sources. BuildClinical's Secure Socket Layer (SSL) software encrypts all inputted information and keeps their information private and HIPAA compliant. Their backend servers are stored in the U.S. at secure data centers. Across all recruitment pathways, information/study advertising content will remain consistent with IRB approved recruitment language.

COMPENSATION FOR PARTICIPATION IN RESEARCH ACTIVITIES

We will reimburse all trial participants for completing research assessments.

Subjects can earn up to $120 for completing study assessments, with $20 per each assessment and $20 for the end of study interview.

Depending on Northwestern University payment guidelines and availability and study team workflows at the time of participation, payments to participants will be made available in one or a combination of the following ways:

- Amazon.com gift card: Participants will be sent a code via email that will allow them to redeem an Amazon.com gift card.
- PNC Stored Value (Visa) Card: If participants do not have an Amazon account or do not wish to be compensated through Amazon, they may request a Stored Value (Visa) Card instead. The cards may be virtual or physical as per participant preference.
- Check: Participants earning more than $100 per calendar year must be paid by check. Checks require a signed W9 form. The check may be mailed to the participant's address.

WITHDRAWAL OF PARTICIPANTS

Patients can discontinue the study at any time at their own request, or they may be withdrawn at the discretion of the investigator for safety, behavioral or administrative reasons. The reason(s) for discontinuation will be documented and may include:

Patient voluntarily withdraws from treatment (follow-up permitted);

Patient withdraws consent (termination of treatment and follow-up);

Patient is unable to comply with protocol requirements; (termination of treatment and follow-up);

Patient demonstrates disease progression (termination of treatment and follow-up unless continued treatment with study intervention is deemed appropriate at the discretion of the investigator)

RISKS TO PARTICIPANTS

Potential Risks: The proposed study poses minimal risks. All potential risks associated with participation in this study will be disclosed in consent documents. Any potential risks that might exist fall into four categories: (a) risks associated with the intervention; (b) risks associated with research assessments, consisting of questions about self-injury, depression, anxiety, and personal functioning, and other mental and emotional problems; (c) risks associated with potential loss of confidentiality; and (d) risks of worsening mental or emotional state. We address each in turn below.

Risks of the intervention: DMHI programs generally have not been shown to cause any harm.[81] The primary risk of the intervention is participants being distracted by their mobile phones while engaged in activities that demand their complete attention. Participants occasionally try to use mobile devices while driving motor vehicles, and therefore will be instructed never to use the mobile phone while driving. Participants will be made aware of the physical, financial, and legal risks associated with using the phone while driving. If the research team becomes aware of a participant engaging in this behavior, the PI and mentors will consult to determine the most appropriate way to eliminate this risk.

Risks associated with research assessments: Research assessments include questions about self-injury, depression, anxiety, and other mental and emotional problems. Participants will give voluntary responses to self-report questionnaires and interview questions; they are told that they can decline to answer any questions that they choose. The instruments and methodologies are well tested and are not known to cause problems or distress on the part of the participants. All research interviews are audio-recorded, for the purpose of review to ensure quality assurance ratings of assessment performance, including ensuring that participants are comfortable with the interview procedures. Audio recordings will be maintained on a secure server with no identifying information in the labels for the duration of the funded study, unless other arrangements are made. On occasion participants may request that audio files be deleted before the end of the study, in which case we will comply.

Risks associated with potential loss of confidentiality: There is a slight risk of loss of confidentiality. There is some possibility that others may see the participant's activity in the app. There is also a small possibility that databases may be hacked, even though they are behind secure firewalls. Measures to protect security in these instances are described below. Confidentiality may be broken by research staff to ensure the participant's safety if there is an imminent threat to self or others. There is also the remote possibility that research records will be subpoenaed by a court of law. All of these potential losses of confidentiality will be disclosed in the consent documents.

Risks of worsening mental or emotional state and or self-harm thoughts/events: Some participants may show a worsening of symptoms or suicidal thoughts and behaviors during the study period. Given that self-injury is an inclusion criterion for this study, the development of worsening suicidal ideation or suicide-related behaviors during the study remains the most serious risk. However, these are risks inherent in the population and would occur whether or not they were enrolled in the study. It is not believed that the risk of suicidal thoughts and behaviors or other adverse outcomes are increased as a function of being enrolled in this study. All potential risks associated with participation in this study will be disclosed in consent documents.

Details on protection against risks are outlined in detail in **"PROVISIONS TO MONITOR THE DATA TO ENSURE THE SAFETY OF PARTICIPANTS"**

POTENTIAL BENEFITS TO PARTICIPANTS
There is no direct or immediate benefit to participants from whom data will be collected, although we anticipate some participants may receive support for their symptoms through the DMHI platform.

DATA MANAGEMENT AND CONFIDENTIALITY
All research data will be electronically recorded and stored in Research Electronic Data Capture (REDCap) tools hosted at Northwestern University. REDCap is a secure, Web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. Data communication between data entry computers and database servers will be encrypted via a VPN client. Access to the VPN connection will require user authentication via username and password. Firewall software will restrict communication to the database server that is absolutely critical for conducting research. The databases and all data entry procedures will be designed to maintain the confidentiality of patients enrolled into the study. Numbers will be used to identify all written study materials, and no personal identifiers will be on such materials. Hard copy files will be stored in a secure double-locked room accessible only to the study team. Audio data will be stored on secure servers and will only be available for coding by study staff. All intervention technologies will be developed using up-to-date security measures that are consistent with those used by Electronic Medical Records and are HIPAA compliant. All data collected via the interventions and assessments are transmitted using Transport Layer Security (TLS) encryption to prevent eavesdropping and tampering information while it is in the transmission pipeline. In addition, all data stored within the intervention is de-identified with a unique key.

To reduce the risk of loss of confidentiality through the participant's device, we will instruct patient participants on how to add a PIN to their phone to prevent unwanted access. To protect against unauthorized access of patient participant intervention data on a mobile phone, intervention data will be encrypted on the phone itself and configured to self-destruct at the command of study staff (for example in the case a phone is reported missing). We will clearly inform the patient participants of the risk of data insecurity.

Data Analysis Plan
The primary aim of this study will be to pilot feasibility for a larger trial. Feasibility will be determined by 1) meeting our recruitment and enrollment goals (90 participants); 2) obtaining 80% of follow-up self-report data over 16 weeks, and 3) having an dropout rate of <30% in one or more of the DMHI conditions, which is in line with previous DMHI RCTs,[48] and would indicate strong engagement worthy of future research. The following analysis plan will also be piloted.

Evaluate the effectiveness of the DMHI in reducing the primary outcomes (frequency of NSSI behavior and urges using the ABASI checklist and ABUSI), secondary outcomes (suicidal ideation, depression, anxiety, and borderline personality disorder symptom severity using the DSI-SS, PHQ-9, GAD-7, BEST), and psychological targets (emotional, cognitive, and behavioral regulation, and self-efficacy using the DERS, DAS-SF, CB-RSS, SEASA) relative to a control. We will use separate generalized linear models (GLM; one model per outcome or target) with link functions depending on the distribution of each construct (e.g., log link for count outcomes, identity link for normally distributed outcomes) to determine if there are overall group differences over time between either of the interventions relative to the control.[83,84] We will examine an interactive effect of the groups over time, and main effects, should there be no evidence of an interactive effect. With repeated measures over time within subject, we anticipate using an autoregressive correlation structure for all models. Secondary analyses of outcomes will control for basic static factors such as demographics (i.e., age and gender). As we expect this feasibility trial will be underpowered to test these hypotheses, least square means and 95% Confidence intervals of each randomization group will be plotted over time for each outcome.

Evaluate the effect of coaching on subjective and objective engagement targets (number of app

launches, time from first to last use) and all primary and secondary outcomes. To increase power all participants will be included in analyses of coached vs. self-guided DMHI, including those control participants. We will use the same GLM methodology as Aim 2a for the first primary outcomes (ABASI & ABUSI) and secondary outcomes, comparing coached and self-guided intervention arms. The engagement targets (number of app launches and engagement duration, defined as time from first to last use) will be compared using either an ANOVA or a Kruskal-Wallis test, depending on the observed distribution. As we anticipate that there will not have ample power to test these hypotheses, we will again present least square means and 95% confidence intervals for these outcomes by coached or self-guided DMHIs and follow-up time.

Experimental therapeutics modeling will explore if engagement targets (subjective and objective engagement) and psychological targets mediate significant effects for distress observed in Aims 2a (treatment vs. control) or 2b (coached vs. self-guided). These models are depicted in Figure 3. A separate model will be run for each of the comparisons articulated in the two aims, for each of the outcomes. The expansion of the experimental therapeutics model to include targets of objective and subjective engagement is critical to understanding the mechanisms by which DMHIs work.[85] We emphasize that these mediational analyses are only exploratory, and serve primarily as pilots to inform the design of our experimental therapeutics aim for a subsequent, fully powered trial.

The mediational analyses will use GLM mediational models to examine that the intervention impacts primary and secondary outcomes via psychological targets, including emotional, cognitive, and behavioral regulation, and self-efficacy. Mediation will be tested using methods by Iacobucci.[86] Our models will test if patient characteristics and target engagement mediate the relationship between intervention and outcomes. Multiple models will need to be fit, increasing the possibility of an inflated type I error. To prevent this, we will implement a false discovery rate (FDR) control using methods by Benjamini-Hochberg[87] although as these are pilot studies, we will test these models at a FDR of 10%. Depending on the distribution of the variables under consideration, we will fit linear or logistic regression models to estimate regression parameters a (messaging and the relationship to potential mediators) and b (mediator relationships to the outcome). Iacobucci shows that a normally distributed test statistic can be constructed from standardized regression parameters Za=a/SEa such that Z(mediation)=Za*Zb/ (sqrt(Za2+Zb2 + 1)) can be used to test for mediation.

Power: Because the primary objective of this phase of the research is to evaluate the feasibility of developing and piloting methods for a larger randomized, controlled clinical trial, the sample size (n=90) is selected to give us adequate experience to develop study procedures. The sample size is not powered for hypothesis testing. However, a power calculation was run to determine the effect size that this trial will be powered to detect. Because general linear mixed model analyses do not easily lend themselves to power calculations, as they are dependent on estimates of covariance coefficients, the effect size estimate was examined for an independent t-test at a two-sided type I error rate of 5%. With 30 participants randomized to each treatment group, we will have 80% power to detect an effect size of 0.65 between control and interventions.

PROVISIONS TO MONITOR THE DATA TO ENSURE THE SAFETY OF PARTICIPANTS

Oversight of the trial is provided by the Principal Investigator Dr. Kruzan. The research assistant and PI will ensure that informed consent is obtained prior to engaging in research activities, and that the study is conducted according to the IRB-approved research plan outlined here. Plans to minimize potential risks involve assessment to detect risk and a safety protocol to ensure the safety of participants. This process will be overseen by a clinical monitor who has expertise in NSSI and suicide risk assessment.

Protection for risks associated with potential loss of confidentiality: Data for all participants will be kept strictly confidential, except as mandated by law. All research files are kept on secure, password protected servers managed by Northwestern University Feinberg School of Medicine Information Technology. All electronic data will be stored on secure servers behind firewalls meeting all security requirements of the medical school. Participants will be assigned a numerical code for identification in the files. Names and other identifiers will be kept in separate password protected files. Audio and video data will be stored on secure servers and will only be available for coding by study staff.

To reduce the risk of loss of confidentiality through the participant's device, we will instruct participants on how to add a PIN to their phone to prevent unwanted access to the DMHI app.

Protection for risks of worsening mental or emotional state and/or suicidal thoughts/events: Some participants may show a worsening of suicidal thoughts or behaviors (STBs) during the study period. The development of worsening STBs during the study remains the most serious risk. Participant care will always take precedence over study protocol.

There are a number of pathways through which suicidal risk can be detected. STBs may be detected through automated self-report assessments, through direct communications with the study staff, or via phone or messaging (email, text, etc.). In each of these instances, the goal will be to rapidly acquire additional information that can trigger safety procedures, if necessary.

Suicidality is assessed in self-report assessments using item #9 of the PHQ-9, items # 8 and #10 of the BEST, and the DSI-SS. If participants score >=1 on the PHQ-9 item #9, or >=2 on items #8 or #10 on the BEST, or >=2 on the DSI-SS the REDCap questionnaire will branch to suicide item (item #9) from Beck Depression Inventory (2nd edition; BDI-II). If item #9 of the BDI-II is >=2 or if either items B or D on the DSI-SS >=3, **a message will be immediately displayed in the REDCap questionnaire** making participant aware we are not an emergency service and should they need immediate help or be in danger, they should call or text the national suicide prevention lifeline, the Trevor Lifeline, text the Crisis Text Line. In this message the user will also be informed that research staff will be reaching out to them by telephone no later than the next business day.

In addition to this automated message**, an automatic and immediate notification will be sent to the research coordinator and to the clinical monitor** (a licensed mental health clinician). This automation is built into REDCap so the research coordinator and clinical monitor will receive an email. The research assistant, trained in administering the Columbia Suicide Severity Rating Scale (CSSRS) will contact the participant by phone for further assessment using the interview-based CSSRS no later than the next business day.

To ensure automated risk assessment alerts are accurately sent by the system, the research team will manually review all relevant measures daily for the first 4 weeks of the study. When the clinical monitor and PI are confident alerts are being accurately raised, there will be weekly review as a quality assurance measure.

Additionally, if any suicide item is endorsed (>0), we will display crisis resources such as the national suicide prevention lifeline, the Trevor lifeline, the Crisis Text Line all of which are staffed 24/7 every day as well as a repository of warmlines that individuals can use.

Any detection of suicidal ideation through within app text logging (e.g., in response to the conversational agent) will be **flagged by keyword** and initiate the same process for outreach. Finally, the Columbia Suicide Risk Assessment will also be administered if participants indicate suicidality during phone interviews or calls.

Participants in the study may also send a message to a study staff at any point in the study and for any reason. In these instances, if staff receive **a direct communication** from a participant revealing suicide risk, they will enact the CBITs Suicidality Protocol which involves outreach to the participant for risk assessment via the Columbia Suicide Severity Rating Scale and management (including delivery of a coping plan, referral to resources, or contact emergency services in cases of imminent danger) (described below)

Ensuring participant safety: Once the study staff is notified of potential suicidality, the clinical monitor (a doctorate-level clinical psychologist or masters-level clinical social worker) will ensure all actions necessary are taken to ensure participant safety.

A trained member of the research team will respond within one business day by evaluating all necessary data including study records, calling the participant to enact the assessment procedures based on the Columbia Suicide Severity Rating Scale and management procedures that include, creating a support plan with the participant which is a recommended best practice when working with individuals experiencing suicidal ideation[69–71]. If necessary, trained study staff may call crisis services with the participant to complete a warm-handoff to crisis workers. In some rare cases study staff may refer patients to emergency services or request that a "health and safety" check be performed. The study staff, in collaboration with the clinical monitor, will take any other actions deemed necessary to ensure the safety of the participant. For participants showing potential imminent dangerousness, this may include recommending hospitalization, calling emergency services in the participant's jurisdiction to perform a "health and safety" check, or any other actions deemed necessary to ensure the safety of the patient. The monitoring clinician also has the option of recommending that the patient be discontinued from the study and referred for more appropriate care. Participants with significant suicidality that is not emergent will be provided with crisis resources (e.g. a safety plan, the national suicide prevention lifeline, the Trevor lifeline, the Crisis Text Line, and a list of warmlines). The monitoring clinician may also have the participant referred for more appropriate care.

Because research assistants are usually the main point of contact for participants, they will be given thorough training in the assessment of STBs. While the clinical monitors will be responsible for the management of suicidal participants, it is possible that an emergent situation will arise that requires immediate attention. All study staff will be trained in the identification of imminent danger and procedures to ensure participant safety, including referral to crisis resources, identification of the participant's location, and contacting local emergency services. The PI will also be notified of all cases of STBs, will consult with the clinical monitor, and will be continuously updated. Any psychiatric problem rising to the level of an adverse event will be reported to the IRB, the DSMB chair, and the PO within the timeframes outlined under the NIH General Reporting Policy.

We note that risks related to suicidal thoughts and behaviors are inherent in the population and would occur whether or not they were enrolled in the study. We do not believe that the risk of these suicidal, or other adverse outcomes, are increased as a function of being enrolled in this study or receiving our DMHI during the trial phases. All potential risks associated with participation in this study will be disclosed in consent documents.

Deterioration in the severity of depressive or psychiatric symptoms is the other potential risk: If research staff believe that a participant has deteriorated substantially either by showing a worsening in the presenting psychiatric symptoms or by the development of new symptoms, the clinical monitor will immediately be informed. The clinical monitor will evaluate the participant, notify the PI and DSMB, and make any necessary referrals for the care of the participant. If the PI, in consultation with the DSMB Chair, determines it is in the participant's best interest to cease participation in the study, the participant will be terminated from the study, and referrals and assistance will be given in obtaining appropriate treatment. Reports will be filed with all necessary governing bodies, including the Northwestern University IRB and the DSMP Committee.

We note that we do not believe that the risk of these depressive, suicidal, or other adverse outcomes are increased as a function of being enrolled in this design study. All potential risks associated with participation in this study will be disclosed in consent documents.

Quality assurance procedures:
Sources of material: Questionnaires and app use data.
Data confidentiality and security: Data for all participants will be kept strictly confidential, except as mandated by law. All research files are kept on secure, password protected servers managed by Northwestern University Feinberg School of Medicine Information Technology. All electronic data will be stored on secure servers behind firewalls meeting all security requirements of the medical school. Any paper documentation (which we do not anticipate) is kept in locked file cabinets or a locked file room. Participants will be assigned a numerical code for identification in the files. Names and other identifiers will be kept in separate password protected files. Audio data will be stored on secure servers and will only

be available for coding by study staff. To reduce the risk of loss of confidentiality through the participant's device, we will instruct participants on how to add a PIN to their phone to prevent unwanted access to the DMHI app. All data transmission of data from a participant's device to study servers will be secured using industry-standard encryption tools.

Description of responsible entity: Oversight of the trial is provided by the Principal Investigator Dr. Kruzan . The research assistant will ensure that informed consent is obtained prior to engaging in research activities, and that the study is conducted according to the IRB-approved research plan. All incoming data are automatically monitored for STB risk. A notification is automatically sent to the study coordinator and data manager when a participant indicates risk. Study evaluators and coaches are trained to identify and report risk. The clinical monitor, PI, and any other relevant study staff are notified when risk is detected.

Study data (masked as to treatment assignment) are accessible at all times for the PIs, the biostatistician, and all relevant Co-Is to review. The biostatistical team and study manager will conduct analyses of accrual, drop-outs, protocol deviations on a monthly basis initially, which may drop to quarterly once we are confident that procedures are functioning adequately.

The study has a Data Safety Monitoring Board (DSMB), chaired by Peggy Andover, PhD, an Associate Professor of Psychology at Fordham University and an expert in nonsuicidal self-injury (NSSI) with experience both in running trials of interventions for NSSI and running DSMBs. Dr. Andover has identified two additional DSMB members: Anthony Pisani, PhD (Associate Professor, University of Rochester) is an expert in suicide prevention with considerable experience in younger populations and Stephen Schueller, PhD (Associate Professor, University of California, Irvine) is an expert in DMHIs and will be helpful in addressing the unique issues in data acquisition and quality for this trial. Dr. Mohr, Dr. Washburn (clinical expert) and Dr. Kwasny (biostatistician) will attend the DSMB meetings as a non-voting members to facilitate communication between the DSMB and study personnel. The DSMB will meet at least every 6 months in during the trial, or on a schedule determined by Dr. Andover.

Dr. Kruzan will review adverse events (AEs) and serious adverse events (SAEs) individually in real-time and in aggregate at each DSMB meeting. The PI ensures all protocol deviations, IRB/ISM/DSMB/OHRP suspension, AEs, and SAEs are reported to the IRB and the NIMH program officer according to the NIH General Reporting Policy. Protocol violations and adverse events will be reported in the annual progress report; unanticipated problems involving risks to subjects or others or unexpected SAEs related to study participation will be reported to the NIMH PO within 10 business days of the PI or study team members learning of events; and deaths related to study participation will be reported immediately following PI knowledge (no later than within 5 business days); IRB/ISM/DSMB/OHRP suspension will be reported to the NIMH PO within 3 business days of receipt. All efforts will be made to report SAEs and specific treatment-associated AEs to the IRB and NIMH program officer within 24 hours.

For this study, the following standard AE definitions are used:

Adverse event: Any unfavorable and unintended sign or symptom temporally associated with the use of digital mental health interventions, regardless of whether it is considered related to intervention.

Serious Adverse Event: Any AE that results in any of the following outcomes:

- Death
- Life-threatening situation
- Event requiring inpatient hospitalization or prolongation of existing hospitalization
- Persistent or significant disability/incapacity

AEs are graded according to the following scale:

- Mild: An experience that is transient and requires no special treatment or intervention. The experience does not generally interfere with usual daily activities.
- Moderate: An experience that is alleviated with simple therapeutic treatments. The experience impacts usual daily activities.
- Severe: An experience that requires therapeutic intervention. The experience interrupts usual daily activities. If hospitalization (or prolongation of hospitalization) is required for treatment it becomes an SAE.

The study uses the following AE attribution scale:

- Not related: The AE is clearly not related to the study procedures (i.e., another cause of the event is most plausible and/or a clinically plausible temporal sequence is inconsistent with the onset of the event).
- Possibly related: An event that follows a reasonable temporal sequence from the initiation of study procedures, but that could readily have been produced by a number of other factors.
- Related: The AE is clearly related to the study procedures.

PROVISIONS TO PROTECT THE PRIVACY INTERESTS OF PARTICIPANTS

Potential participants will be identified by the eligibility survey. Prior to being consented, candidates will receive information about the study. Candidates who decline the consent procedure or who are screened out will have any identifying information removed from study records. Consent for the study will then be managed by research study personnel. The study team will not release the identity of any participant to any non-authorized individual, except as is necessary for participant safety or regulatory review.

COMPENSATION FOR RESEARCH-RELATED INJURY
N/A

ECONOMIC BURDEN TO PARTICIPANTS
There will be no cost to participants to receive the NSSI DMHI. It is possible that some participants might have very limited data plans, and the use of NSSI DMHI will cause them to exceed their data limit resulting in fees. The NSSI DMHI should not use unusually large amounts of data, so this is an unlikely occurrence, and the study team asks about participant data plans and will inform participants of the expected data usage prior to downloading the app. There are no procedures that will be billed to insurance.

CONSENT PROCESS

Consent procedures will be written at an 8th grade reading level to ensure that they are understandable by English Speaking participants 18-24. Informed consent will be collected from participants prior any enrollment or study procedures. Patients who appear eligible based on the initial screening assessment will be provided the informed consent online, which they will be asked to sign electronically. Research staff will review the consent document and be available to answer any questions during the “set up” call. If participants do not consent, their screener data will be retained for reporting purposes, but their data will not be used in future research. All research personnel will be comprehensively trained in human subject protections, including successful completion of the applicable sections of the Collaborative Institutional Training Initiative. REDCap reports will be generated daily to alert the study coordinator to follow-up with subjects who have not signed the digital consent form. Participants may download a copy of the consent document or contact study staff at any time to request a copy.

NON-ENGLISH SPEAKING PARTICIPANTS
Non-English speaking participants will not be enrolled.

PROTECTED HEALTH INFORMATION (PHI AND HIPAA)
N/A

QUALIFICATIONS TO CONDUCT RESEARCH AND RESOURCES AVAILABLE
The PI, Dr. Kaylee Kruzan, Research Assistant Professor in Preventive Medicine has expertise in both digital interventions and NSSI among adolescents and young adults. Dr. David C. Mohr, Professor of Preventive Medicine and Director of Northwestern University’s CBITs, is a leading expert in digital mental health research. Dr. Jason Washburn, Professor of Psychiatry and Behavioral Science and Director of Graduate Studies for Clinical Psychology, is an expert in NSSI treatment. Dr. Madhu Reddy, Professor

and Co-Director of CBITs, is a human-computer interaction scientist who has focused on the design, evaluation, and implementation of health technologies, with expertise in mental health. Dr. Andrea Graham, Assistant Professor of Medical Social Sciences, has expertise developing and managing coaching protocols for DMHIs across multiple projects within CBITs. Dr. Mary Czerwinski, Research Partner and Leader of the Human Understanding and Empathy group at Microsoft Research, specializes in human-computer interaction (See letter of support). Dr. Mary Kwasny, Professor of Biostatistics and longtime collaborator with CBITs, has deep experience with the types of data produced by DMHIs as well as the appropriate application of statistical methods to address the unique features of these data.

Feasibility of proposed work and timeline. This work will be carried out over 1.5 years,
The investigators have considerable experience with user-centered design, development of digital mental health treatments, and the conduct of randomized controlled trials. CBITs has a virtual clinical trials platform that enables automated recruitment, consenting, enrollment, randomization, assessment, and provides trial management tools that can monitor data acquisition. This platform has been used for multiple clinical trials and has been described in several papers.[72,73] We feel confident in our recruitment strategy, which is based on our prior work using similar methods. We expect to enroll approximately 10 participants per month during the trial, which is very achievable given our experience with online recruitment and our virtual clinical trials platform. The lost-to-follow-up rate will be minimized by 1) paying participants $20 for each assessment and 2) encouraging participants to continue completing paid outcomes assessments even if they drop out of treatment.

MULTI-SITE RESEARCH
N/A

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